HW1 Heat, Temperature, and Internal Energy

1. Explain how it is possible for heat to flow between to objects even if the internal energies are the same.

   The object could have different internal energy concentrations, e.g., a small mass with high temperature and a large mass with lower temperature.

2. For objects in thermal equilibrium, which of the following is true?

   a) Each is at the same temperature

3. A typical thermos bottle has a thin vacuum space between the shiny inner flask (which holds the liquid) and the shiny protective outer flask, often stainless steel. The vacuum space is excellent at preventing

   e) conduction, convection and radiation

4. Heat is

   c) the energy transferred between objects as a result of a difference in temperature

5. Radiation is emitted

   d) by any object not at 0 K

6. Match the heating mechanism with a corresponding phenomenon. There may be more than one match. Choose from Conduction, Convection, Radiation, Evaporation.

   1. You feel cold when wearing wet clothes $\boxed{Evaporation}$

   2. A mother rubs a feverish child with rubbing alcohol $\boxed{Evaporation}$

   3. A farmer tills the soil around a fruit tree in preparation for a cold winter $\boxed{Conduction}$

   4. You wear white clothes in the summer $\boxed{Radiation}$

   5. Ice chests are made of Styrofoam $\boxed{Conduction}$

   6. An electric heating coil is inserted at the bottom of a water container, not at the top. $\boxed{Convection}$

7. Explain how a match stays lit.

The low oxygen hot air surrounding the burning match rises, allowing cooler oxygen-rich air to supply oxygen to the fire.

8. Your friend states that heat rises. Explain how you might both agree and disagree with the statement.

Heat moves from areas of higher temperature to lower temperature. It does not necessarily rise. However, hot air rises because it is less dense than colder air.

9. You wish to cool your hot chocolate down to a reasonable drinking temperature, suggest two different methods which would work and explain why they would work.

Put ice into the hot chocolate, and heat will flow into the ice through conduction, lowering the temperature of the hot chocolate.

Put the hot chocolate in the fridge. The hot chocolate will lose heat to the colder surroundings through conduction.